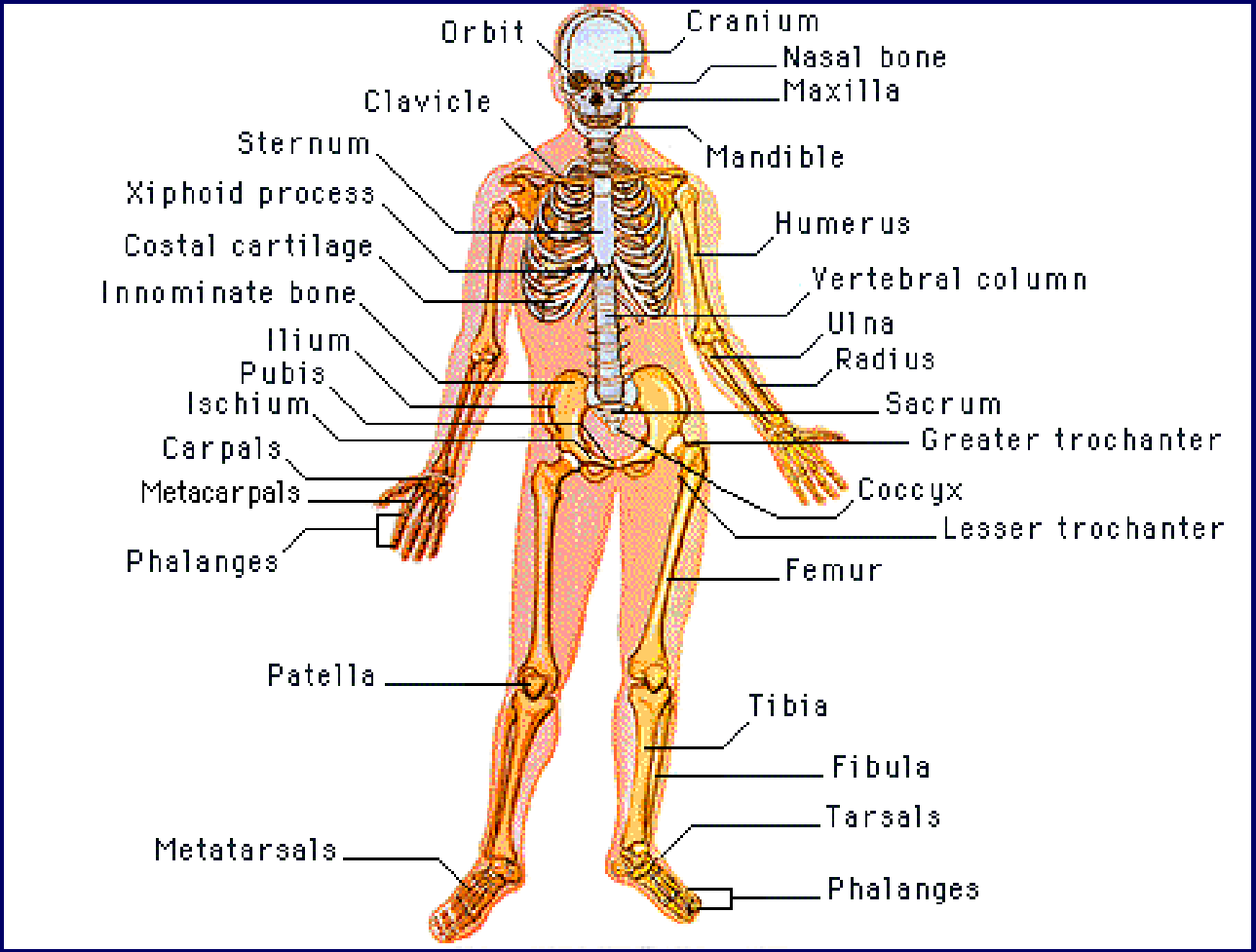
Thoracic Trauma

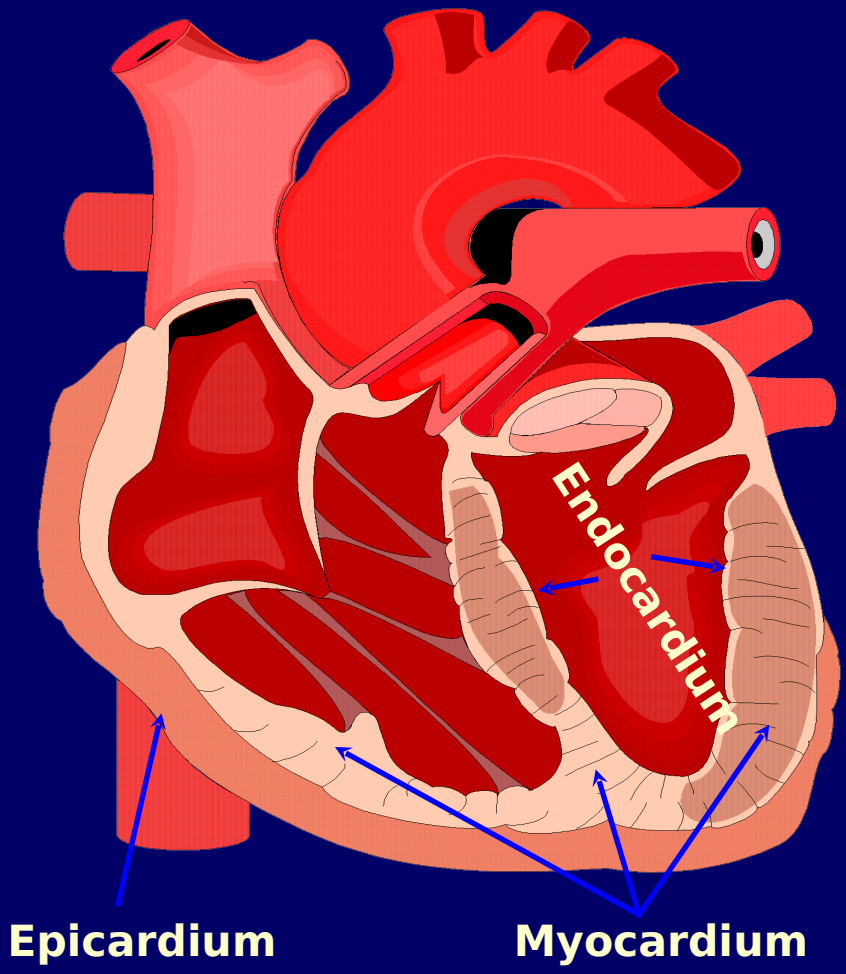
Introduction

- Chest injuries may result from:
  - Vehicle accidents
  - Falls
  - Gunshot wounds
  - Crush injuries
  - Stab wounds

Skeletal System

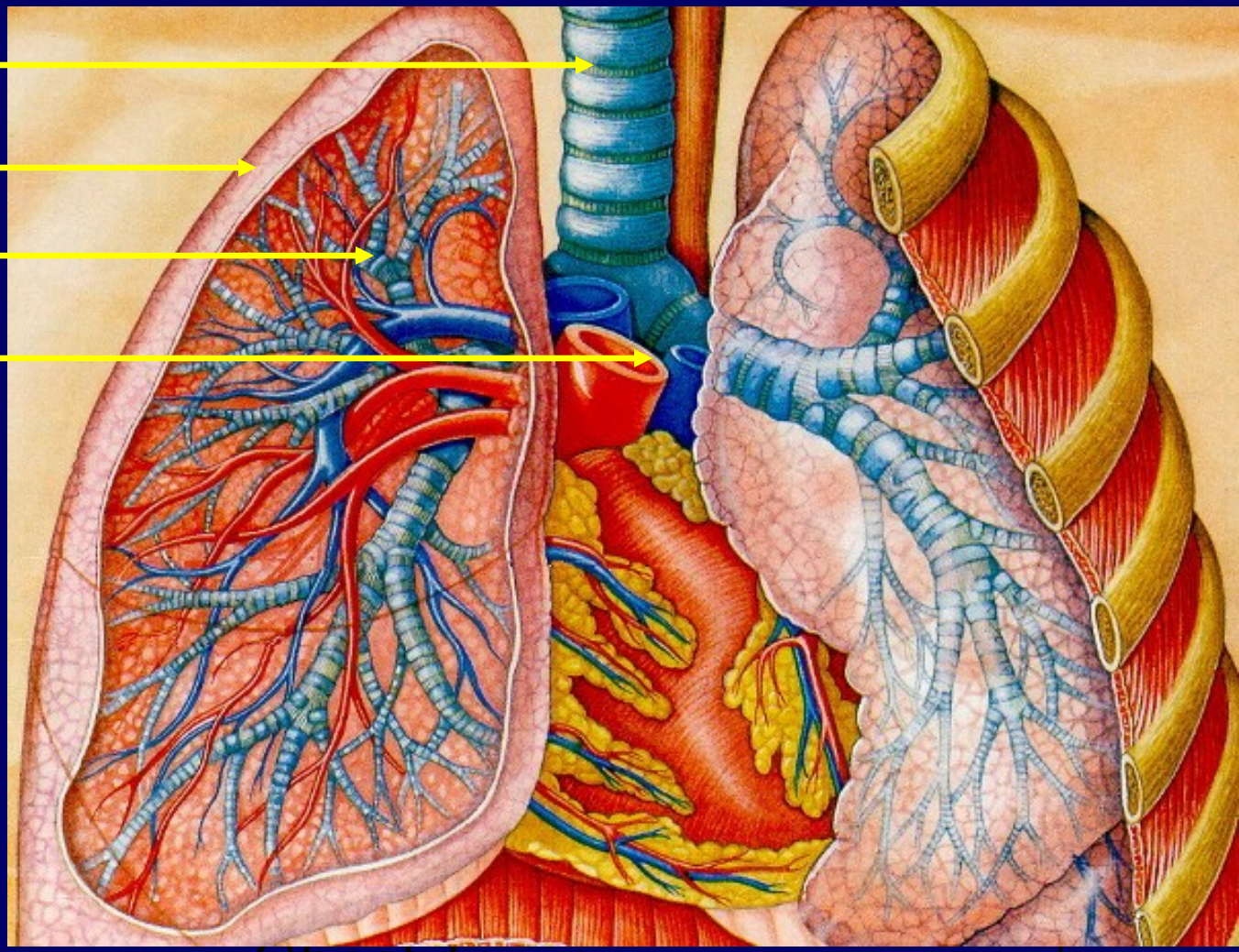


Heart

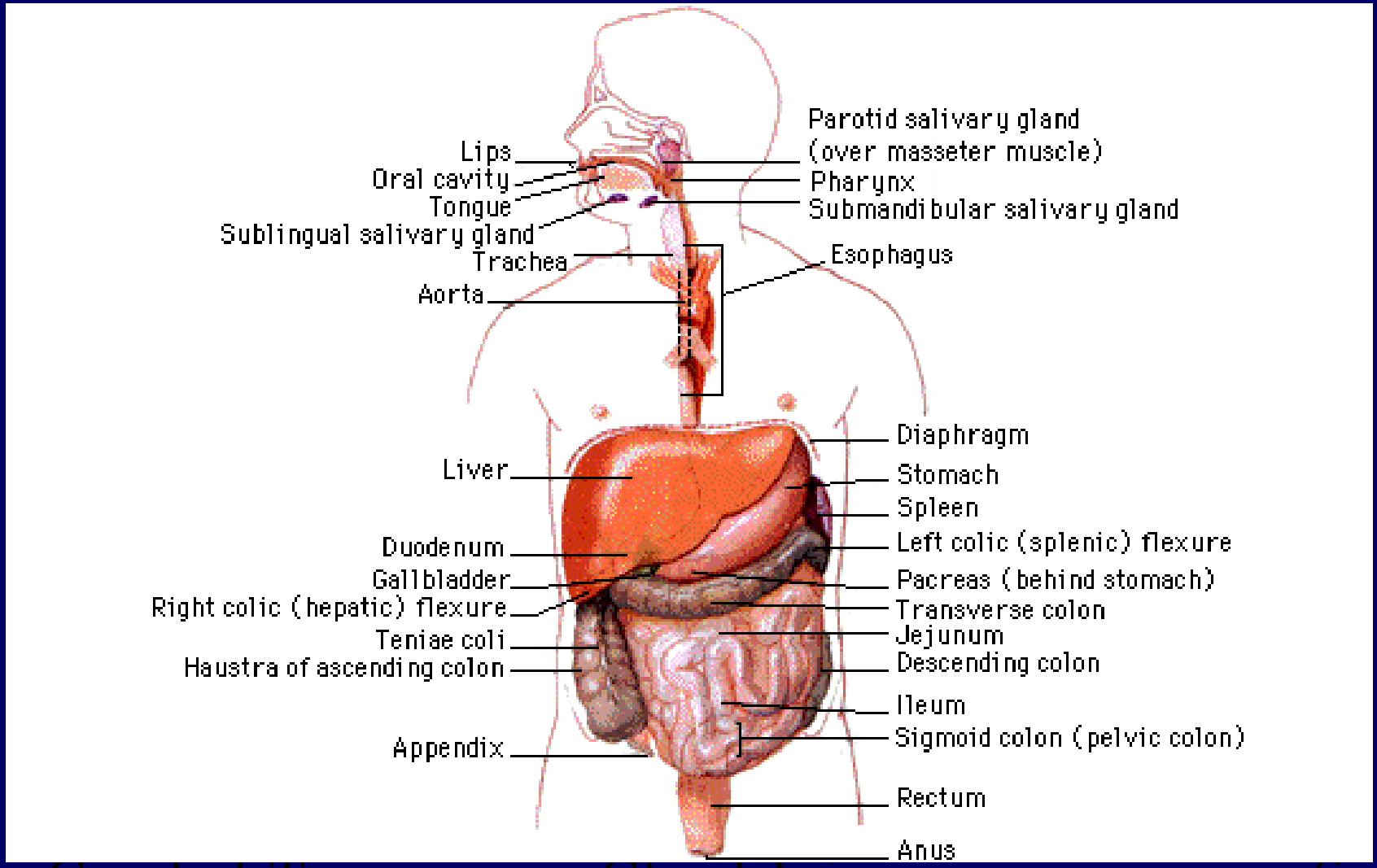


Anatomy of the Thorax

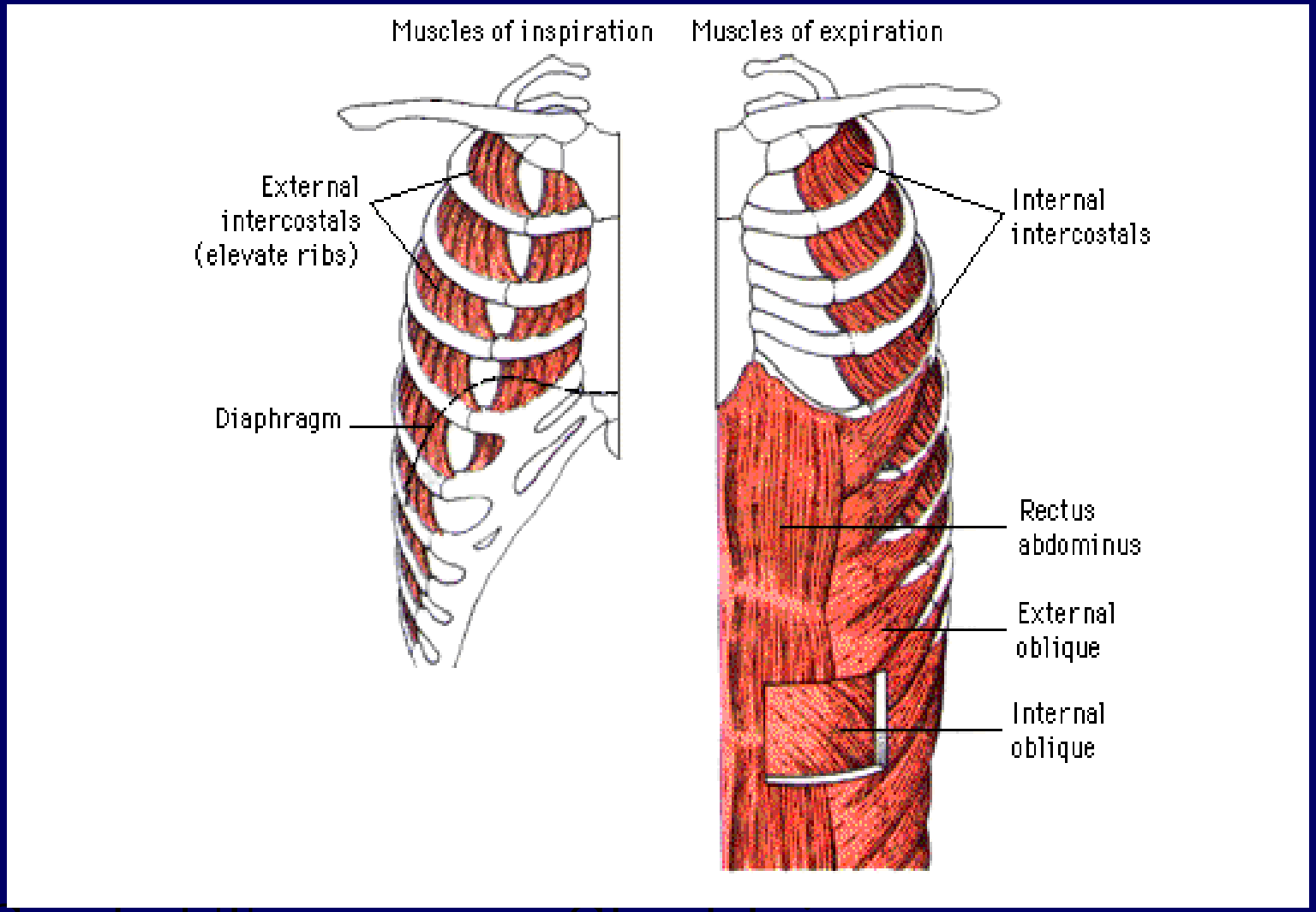
- Trachea
- Lungs
- Bronchi
- Mediastinum



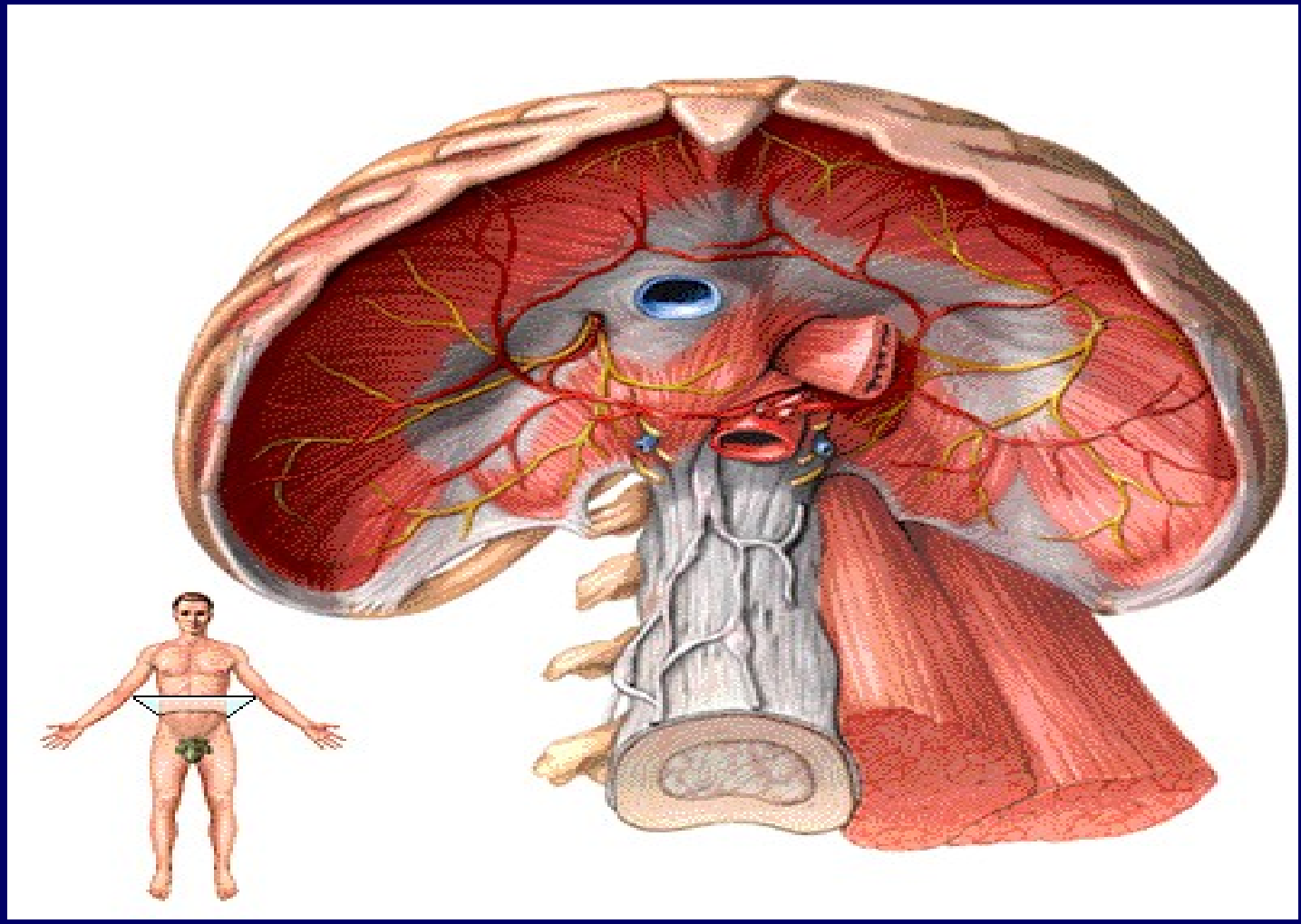
Anatomy


Parotid salivary gland
(over masseter muscle)
Lips
Oral cavity
Pharynx
Tongue
Submandibular salivary gland
Sublingual salivary gland
Trachea
Esophagus
Aorta
Diaphragm
Liver
Stomach
Spleen
Duodenum
Left colic (splenic) flexure
Gallbladder
Pacreas (behind stomach)
Right colic (hepatic) flexure
Transverse colon
Teniae coli
Jejunum
Haustra of ascending colon
Descending colon
Ileum
Appendix
Sigmoid colon (pelvic colon)
Rectum
Anus

Muscles of the Thorax



Diaphragm



Determine MOI

- Mechanism of injury
  - Penetrating trauma
    - Gunshot or stab wounds
    - Bullet trajectory is unpredictable
  - Blunt trauma
    - Viceral injuries occur from:
      - Deceleration
      - Compression
      - Sheering forces
      - Bursting

Assess the casualty

- Identify signs and symptoms
  - AVPU
  - Airway
  - Breathing
  - Circulation
  - Rapid trauma survey / focused exam

Signs indicative of chest injury

- Shock
- Cyanosis
- Hemoptysis
- Chest wall contusion
- Flail chest
- Open wounds
- Distended neck veins
- Tracheal deviation
- Subcutaneous emphysema

Assess Vital Signs

- Pulse
- Blood pressure
  - Hypotension
  - Hypertension

Assess Vital Signs

- Respiratory rate and effort
  - Tachypenia
  - Bradypenia
  - Labored
  - Retractions

Assess the Skin

- Diaphoresis-sweating
- Pallor-pale
- Cyanosis
- Open wound
- Ecchymosis-bruising

Assess the Neck

- Position of trachea
- Subcutaneous emphysema
- Jugular venous distention
- Penetrating wounds

Assess the Chest

- Contusions
- Tenderness
- Asymmetry
- Open wounds or impaled objects
- Crepitation
- Paradoxical movement

Assess the Chest

- Lung sounds
  - Absent or decreased
  - Unilateral
  - Bilateral
  - Location
  - Bowel sounds in chest

Assess the Chest

- Lung sounds
- Percussion
  - Hyperresonance
  - (pneumothorax-tension pneumothorax)
  - Hyporesonance (hemothorax)

Assessing The Chest

Compare both sides of the chest at the same time when assessing for asymmetry.

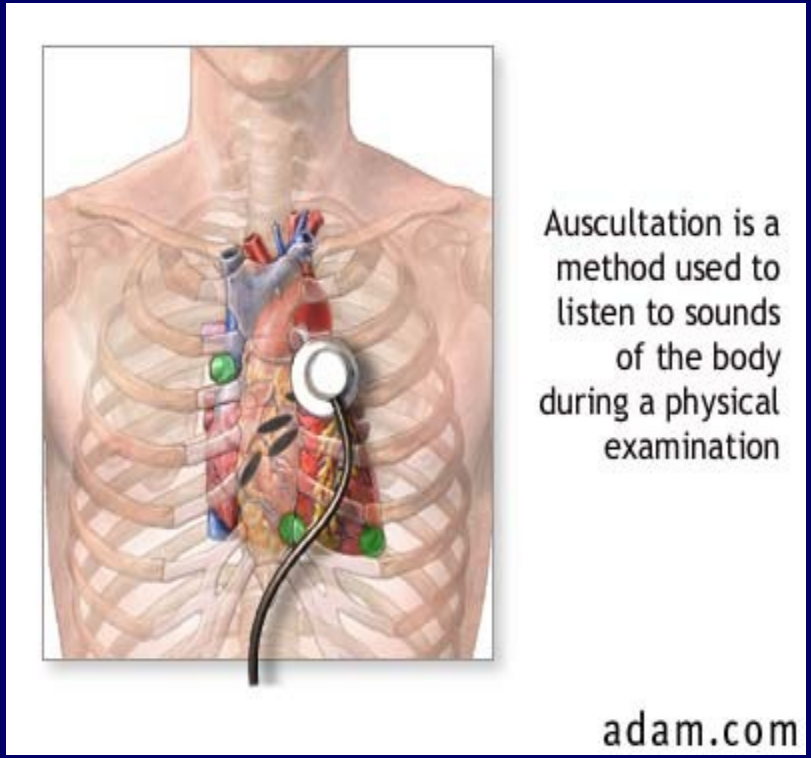
Assessing The Chest

Feel carefully and listen closely for subcutaneous emphysema.

Assess the Chest

- Heart sounds
- Muffled (cardiac tamponade)
- Distant

Cardiac Auscultation Sites



- Listen between the rib spaces, paying particular attention to changes in tone from previous assessment.

Pneumothorax (closed)

- May be caused by blunt trauma or may be spontaneous
- Overpressurization (eg. blast, diving)
- What it is : accumulation of air within space between visceral and parietal pleura

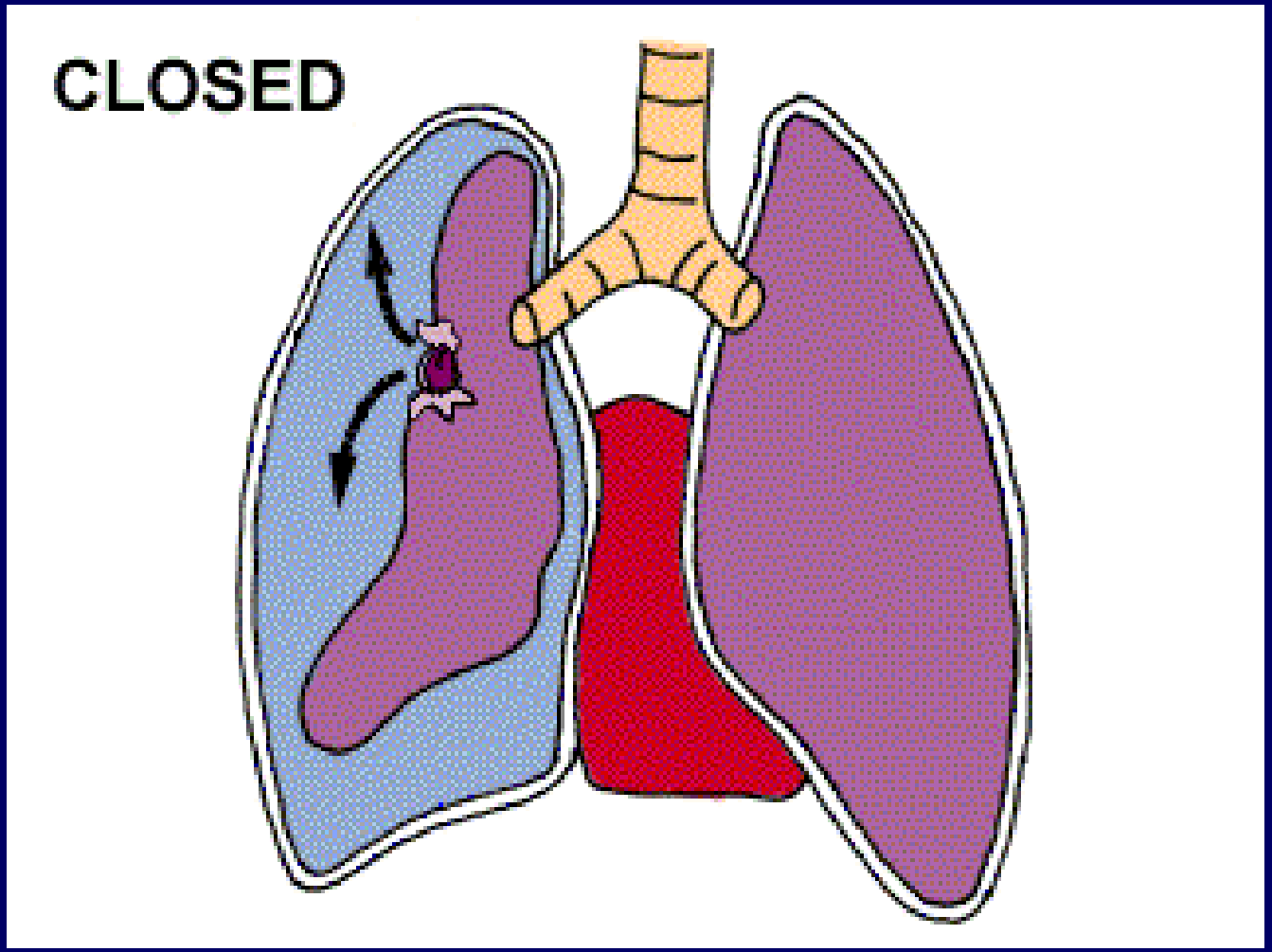
Pneumothorax (closed)

- Signs and symptoms
- Pleuritic chest pain
- Dyspnea
- Decreased breath sounds
- Hypertympany to percussion

Pneumothorax (closed)

- Management
  - Administer oxygen
  - Establish large bore IV
  - Initiate cardiac monitoring
  - Transport to nearest medical facility
  - Chest tube by PA/MD

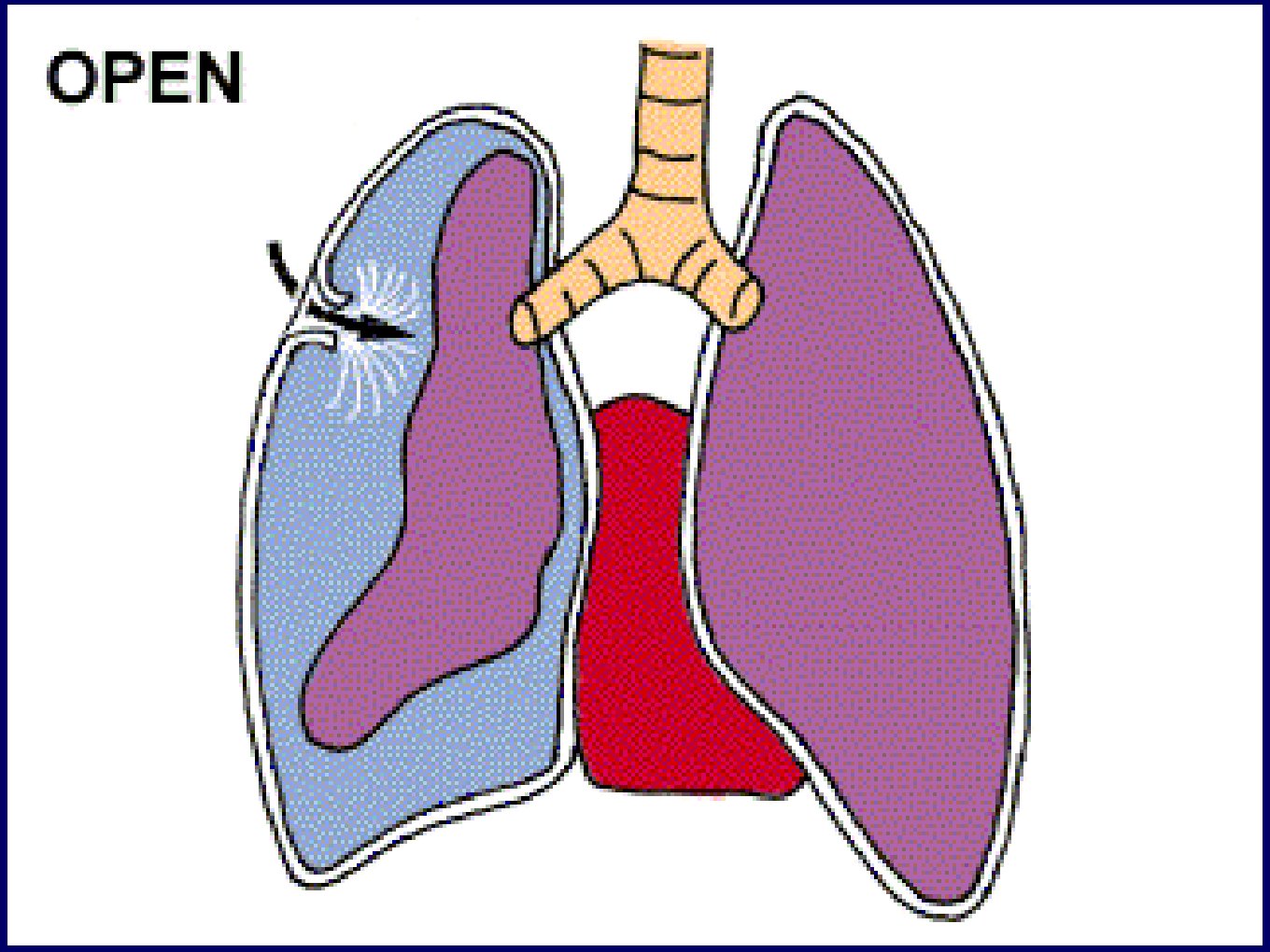
Pneumothorax (closed)



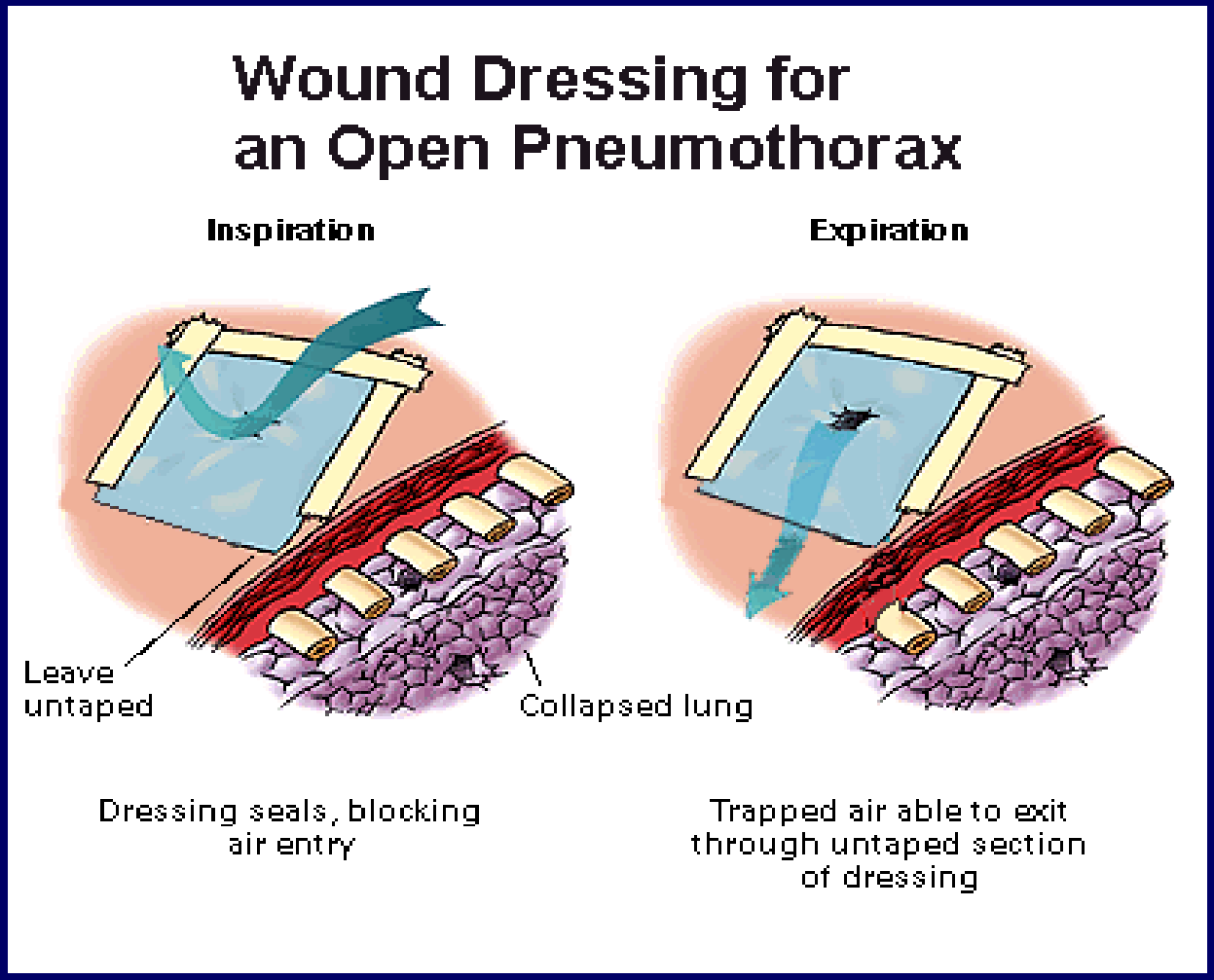
Open Pneumothorax

- Penetrating thoracic injury
- May present as a sucking chest wound
- Management
  - Ensure open airway
  - Administer oxygen 15 lpm if available
  - Close chest wall defect, occlusive dressing (Asherman Chest Seal)
  - Initiate large-bore IV Initiate cardiac monitoring
  - Transport to nearest medical facility

Open Pneumothorax



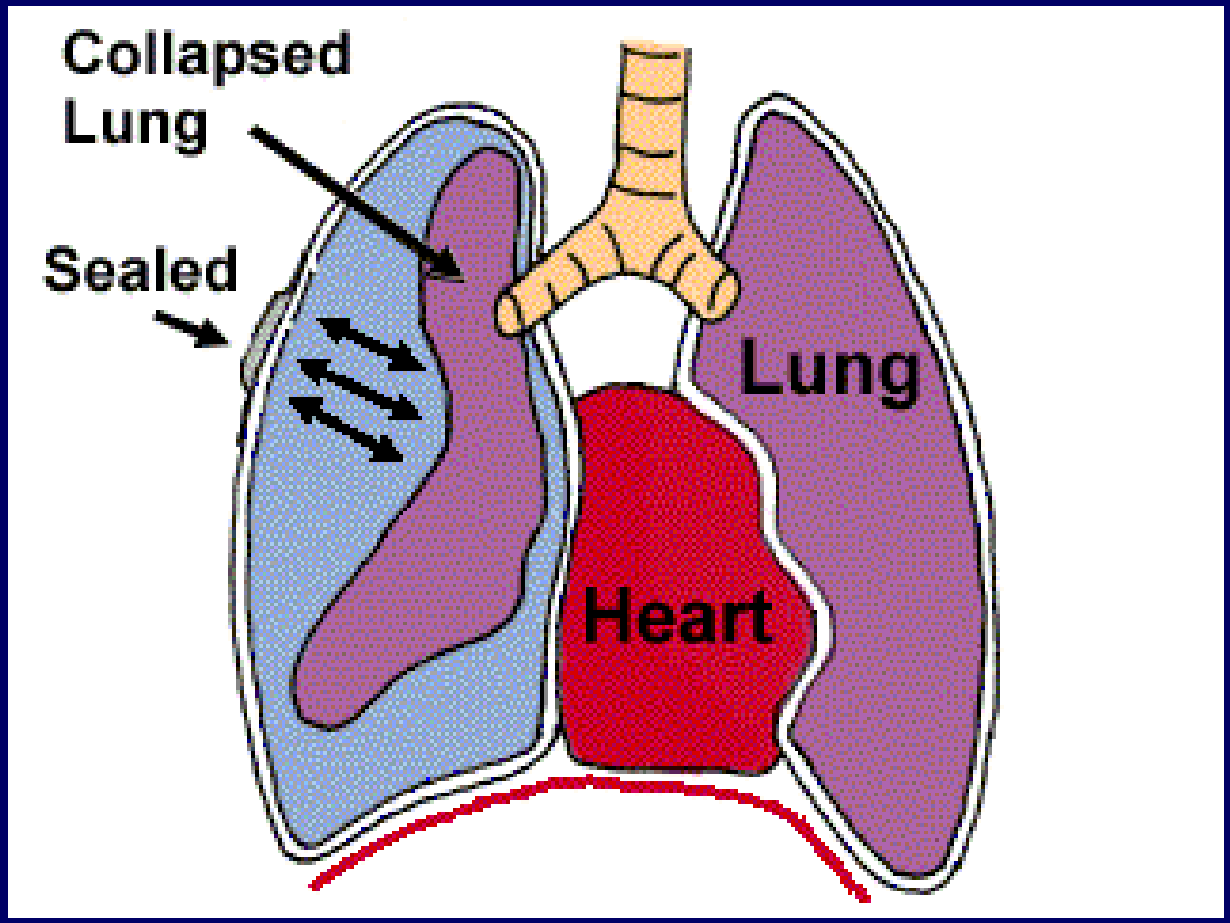
Open Pneumothorax



Open Pneumothorax

Petroleum Gauze can also be used to seal a sucking chest wound.

Open Pneumothorax



Open Pneumothorax

If, after sealing the open pneumothorax, the patient develops increased difficulty breathing, the dressing may not be allowing air to escape. In that case, raise a corner of the dressing to allow the air to escape or remove it completely and re-apply it. Consider needle chest decompression if authorized.

Tension Pneumothorax

- One-way valve created from either penetrating or blunt trauma
- Air enters thoracic space but cannot escape, pressure builds and further collapses the lung and forces mediastinum and heart away from effected lung. May also compromise good lung.

Tension Pneumothorax

- Clinical Signs
- Anxiety, agitation, apprehension
- Diminished or absent breath sounds
- Increasing dyspnea with cyanosis
- Tachypnea
- Hyperresonance to percussion on effected side

Tension Pneumothorax

- Clinical Signs
- Distended neck veins
- Hypotension - loss of radial pulse
- Cool clammy skin, patient deteriorates rapidly
- Decreased lung compliance while bagging

Tension Pneumothorax

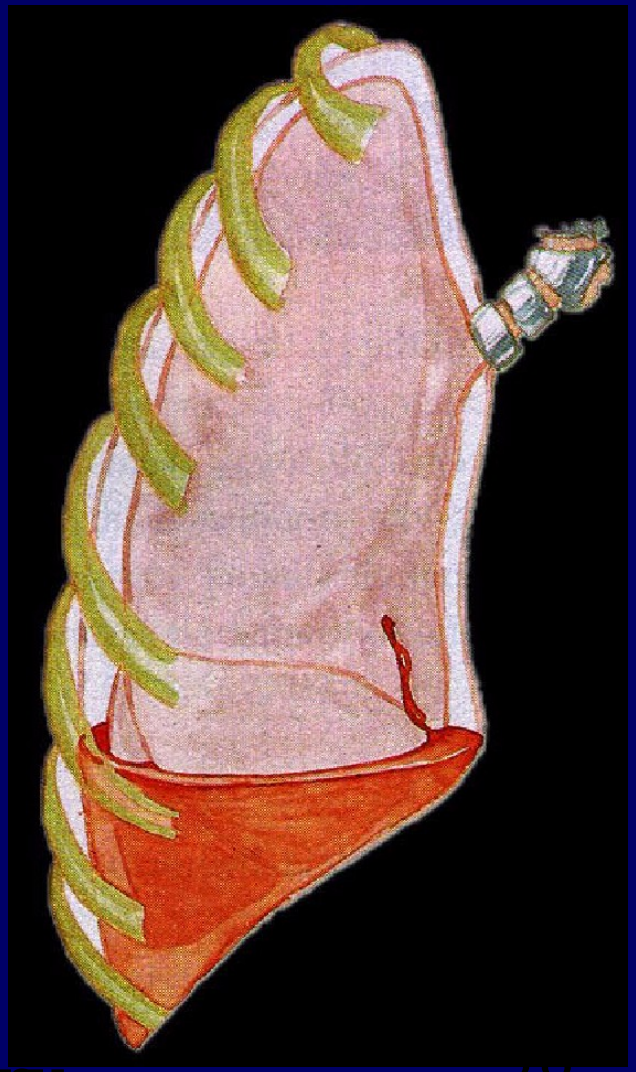
- Clinical signs
- Tracheal deviation is a late sign and its absence does not rule out a tension pneumothorax
- Decreased level of consciousness
- All the above signs may be difficult to detect in a combat situation, you must be alert to this problem with penetrating chest trauma.

Tension Pneumothorax

- Management
  - Ensure open airway
  - Administer oxygen 15 lpm
  - Decompress affected side of chest (shown later)
  - Insert large-bore IV
  - Transport to nearest medical facility

Massive Hemothorax

- Loss of 1500 cc blood or 200 cc per hour from the chest tube
- Signs and symptoms
- Hypotension from blood loss or compression of great vessels
- Dullness to percussion
- Decreased breath sounds
- Anxiety or confusion secondary to hypovolemia or hypoxia

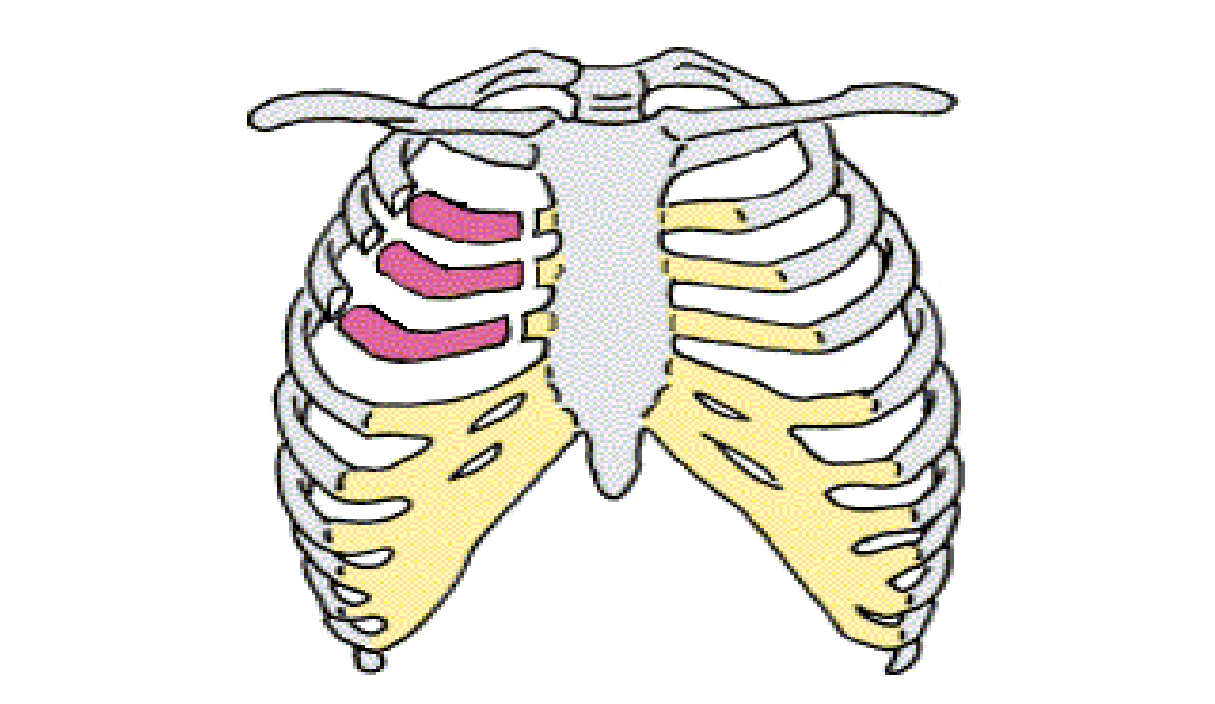


Massive Hemothorax

- Management
  - Ensure open airway
  - Administer oxygen 15 lpm if available
  - Initiate IV to carefully replace fluids and maintain BP @ 80-90mmHg (radial pulse)
  - Observe for development of tension pneumothorax
  - Rapid transport to nearest medical facility

Flail Chest

- Two or more adjacent ribs are fractured in at least two places or separation of sternum from ribs



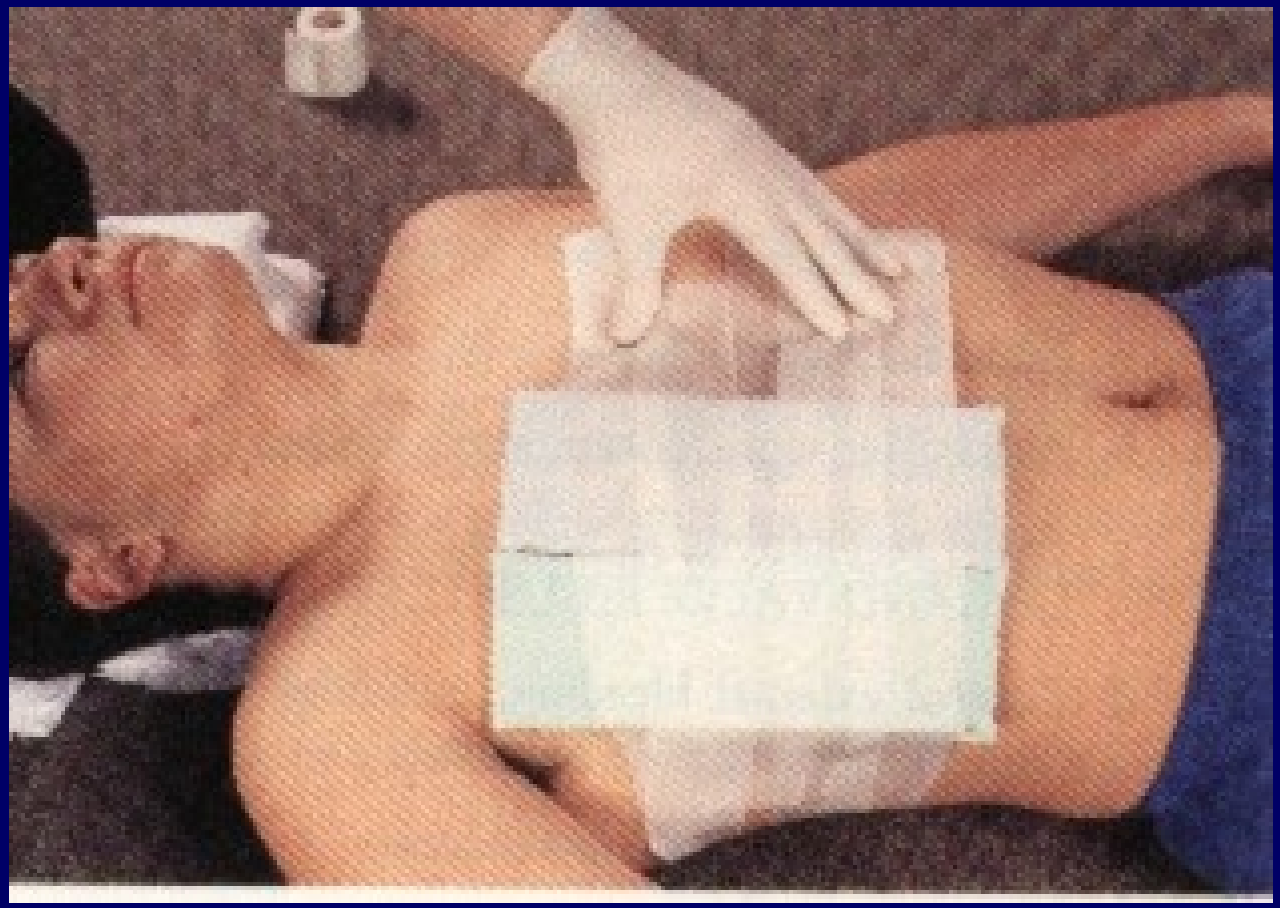
Flail Chest

- Signs and symptoms
- Flail segment moves with paradoxical motion
- Force also causes pulmonary contusion
- Observe for hemo or pneumothorax
- Pain from injury causes increased hypoxia
- Chest wall palpation may reveal crepitus

Treatment for Flail Chest

- Ensure open airway
- Administer oxygen 15 lpm Assist ventilation
- Analgesia for pain (IV Morphine)
- Initiate IV - may need to limit fluids
- Monitor heart for myocardial trauma
- Initiate manual pressure to stabilize flail segment, then apply bulky dressing
- Rapid transport

Treatment for Flail Chest



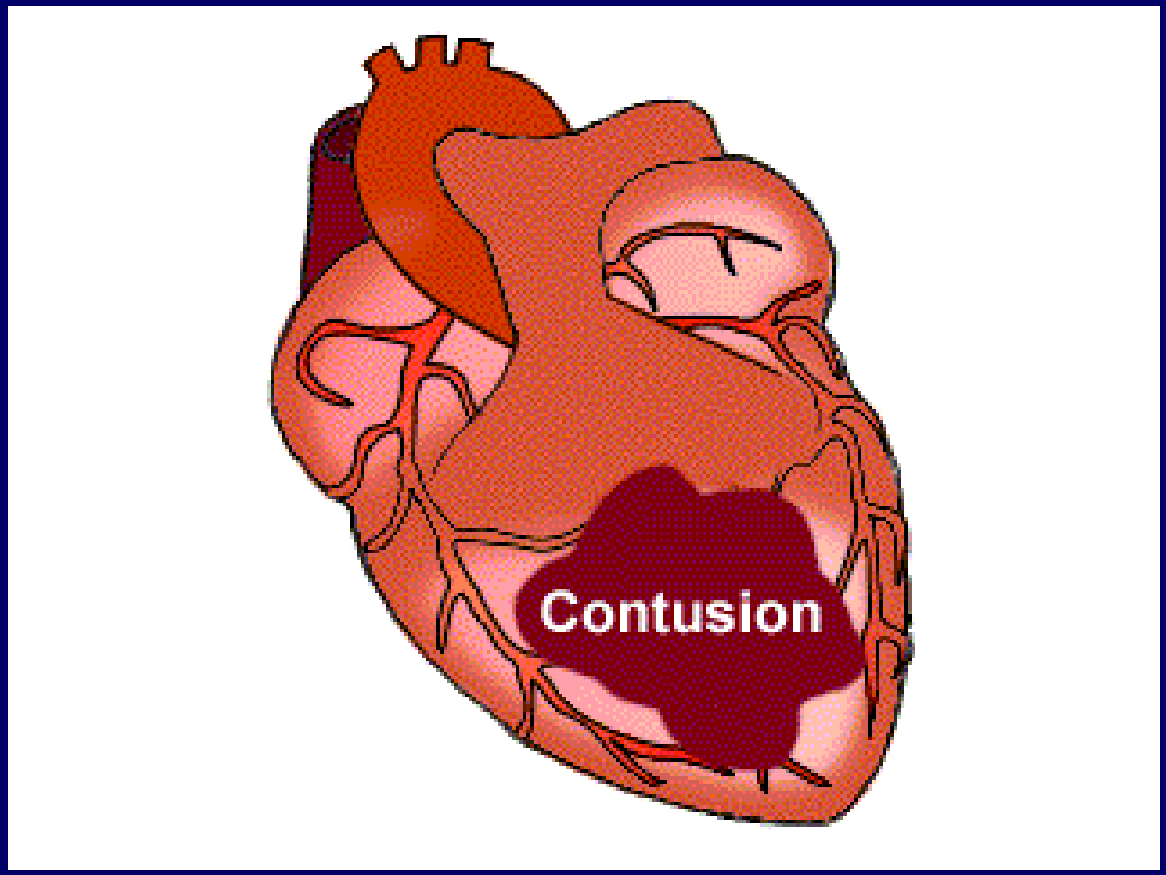
Pulmonary Contusion

- Common injury produced by blunt trauma, which may be potentially lethal
- Bruising of lung can produce marked hypoxemia
- Management
  - Oxygen administration 15 lpm
  - Insert large bore IV - may need to limit fluids
  - Transport to nearest medical facility

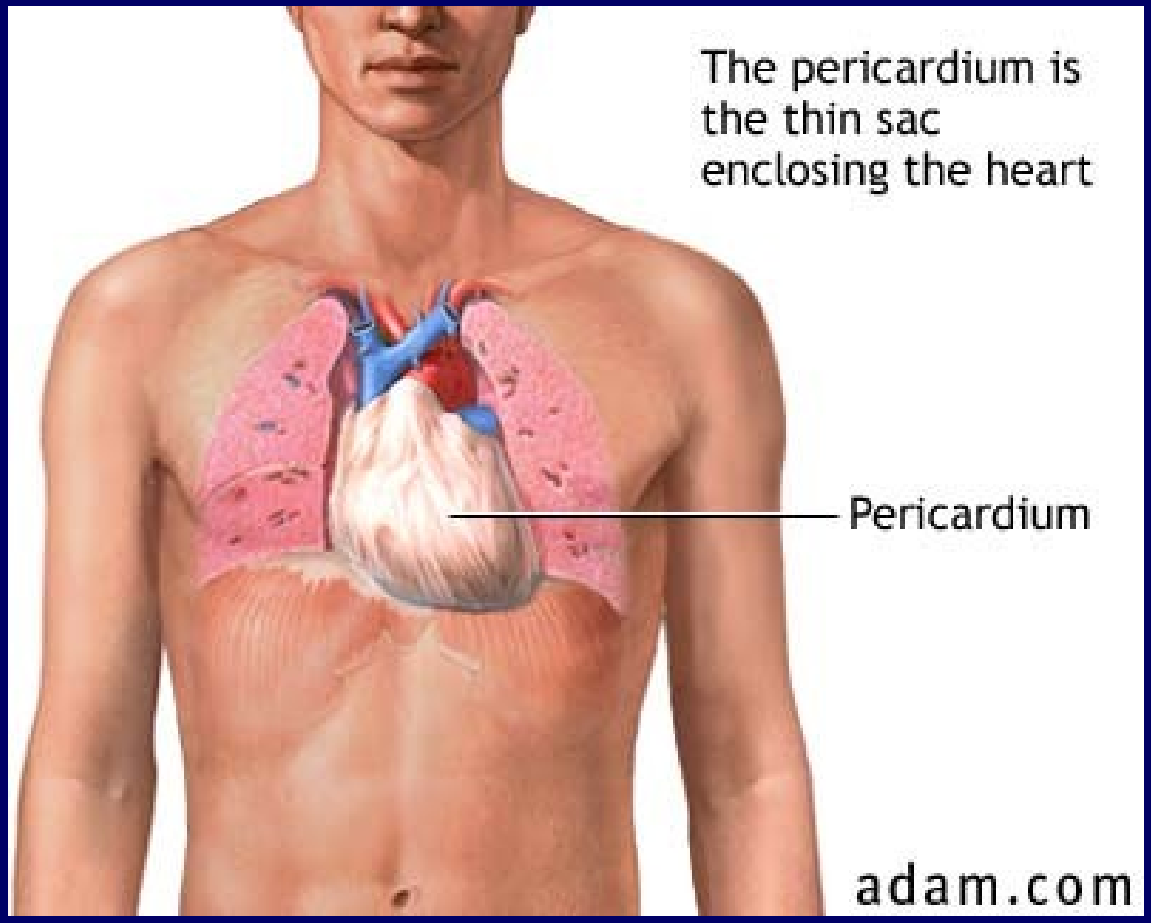
Myocardial Contusion

- Potentially lethal lesion resulting from blunt chest injury
- S/S- chest pain, dysrhythmias, cardiogenic shock
- May mimic a myocardial infarction
- Management
  - Administer oxygen
  - Initiate large bore IV – may need to limit fluids
  - EKG monitoring, pulse oximetry (if available)
  - Transport to nearest medical facility

Myocardial Contusion



Cardiac Tamponade



Cardiac Tamponade

- Usually secondary to penetrating trauma
- Blood rapidly collects between heart and pericardium, this pressure compresses the ventricles and prevents the ventricles from filling, which decreases cardiac output.
- Small amounts of fluids <100ml can cause this

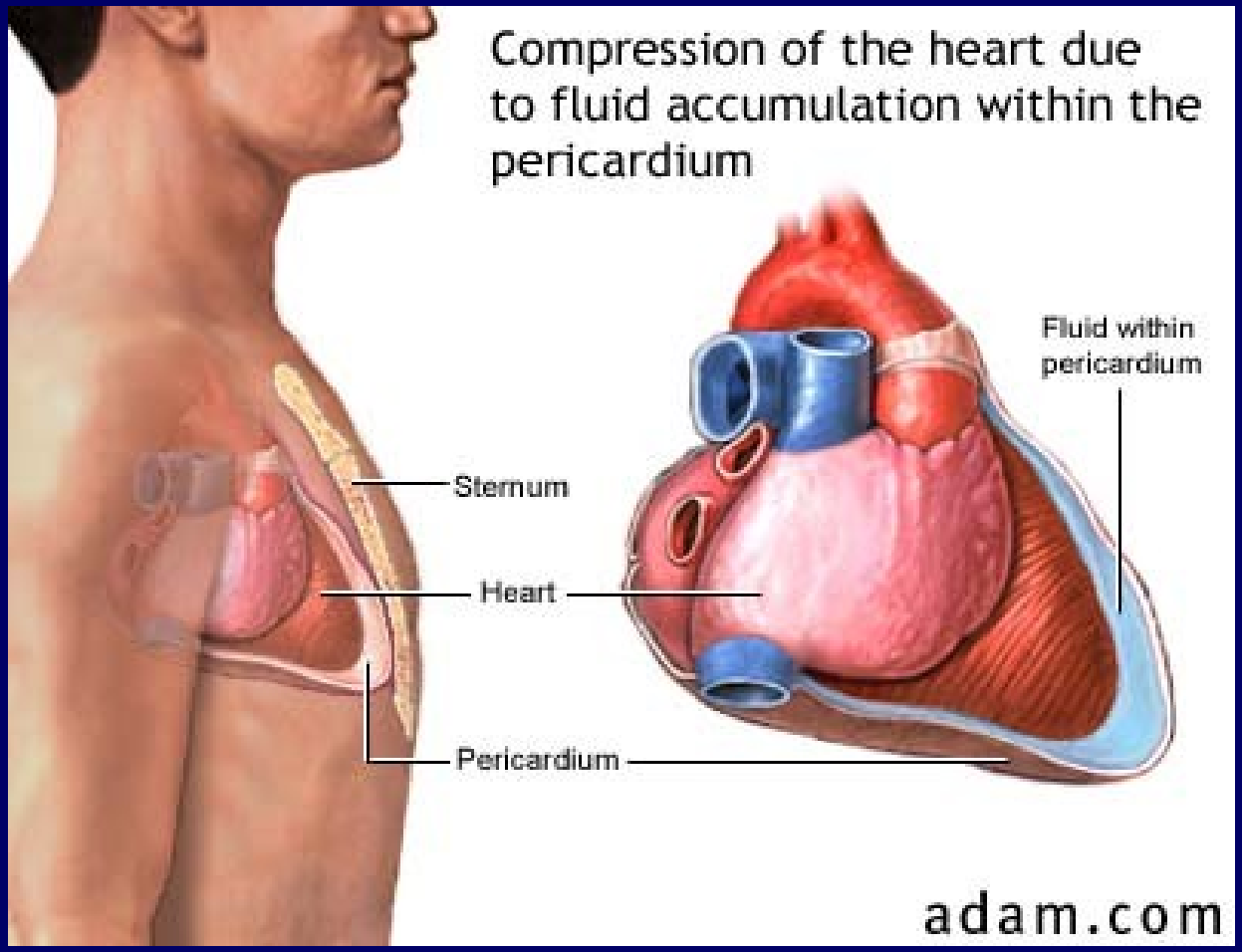
Cardiac Tamponade

- Signs and symptoms
- Hypotension (narrow pulse pressure)
- Muffled heart sounds
- Distended neck veins
- Becks Triad consists of all of the above

Cardiac Tamponade

- Management
  - Ensure airway and administer oxygen 15 lpm
  - Initiate IV - a bolus of electrolyte solution (500-1000 ml) may increase filling of the heart and increase cardiac output
  - Rapidly fatal and not easily treated in field
  - Initiate cardiac monitoring
  - Transport to nearest medical facility

Cardiac Tamponade



Fractures

- Fractures of the Scapula or the first or second rib requires a significant force
- This should alert you to the possibility of major thoracic vascular injury
- 20-30% of patients with fractures of the 1st or 2nd ribs die of associated injuries, 5% die of a ruptured aorta

Fractures

- Management
  - Ensure airway
  - Oxygen 15 lpm if available
  - Initiate large bore IV and treat for shock
  - Transport to nearest medical facility

Simple Rib Fracture

- Most frequent injury to the chest
- Pain may prohibit casualty from breathing adequately
- Area of rib fracture may be unstable and tender
- Management
  - Administer oxygen 15 lpm
  - Monitor for pneumothorax or hemothorax
  - Pain Management Encourage deep breathing
  - Transport if complications arise

Diaphragmatic Tears

- Signs and symptoms
- Can result from a severe blow to abdomen
- Abdomen can appear scaphoid
- Usually occurs on the left side
- May have marked respiratory distress with diminished breath sounds
- May hear bowel sounds in the chest cavity

Diaphragmatic Tears

- Management
  - Ensure airway
  - Administer oxygen 15 lpm if available
  - Insert large bore IV and treat for shock
  - Transport to nearest medical facility

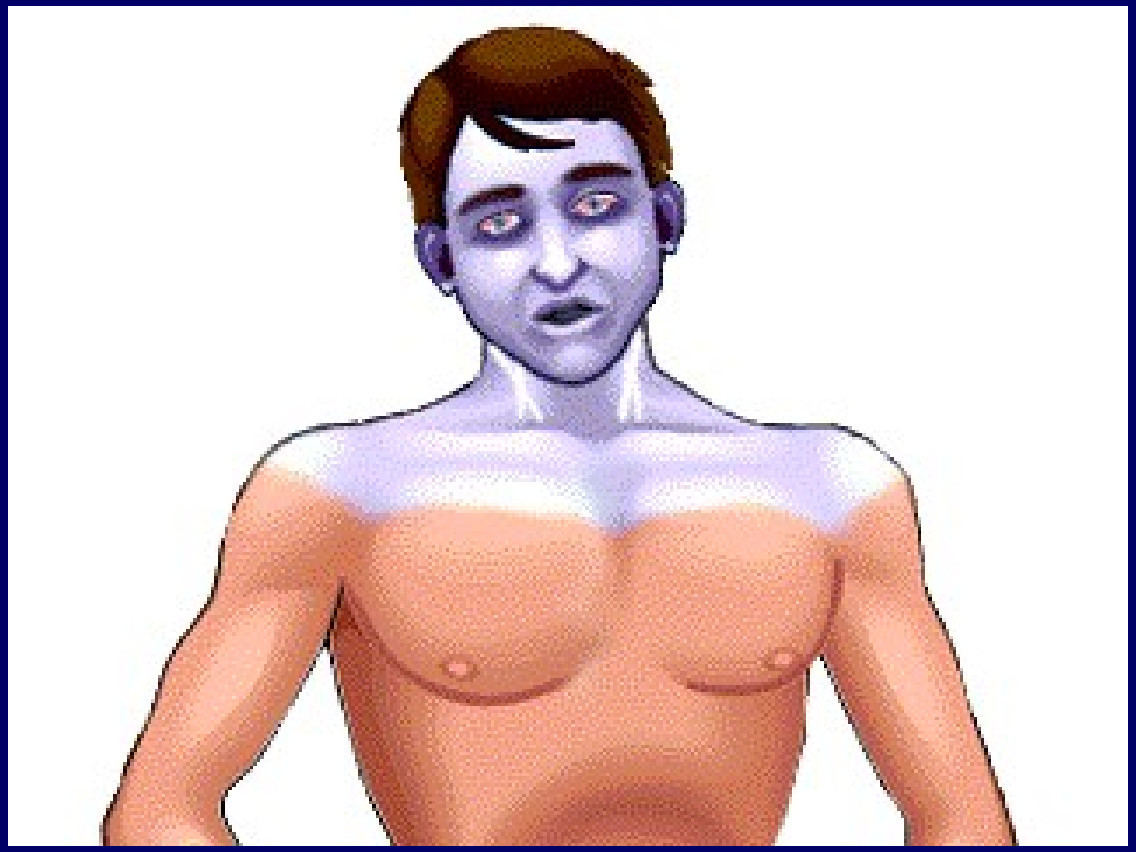
Traumatic Asphyxia

- Severe compression injury to the chest
- Compression of heart and mediastinum
- Signs and symptoms
- Cyanosis and swelling of the head and neck
- Lips and tongue may be swollen
- Conjunctival hemorrhage may be evident
- Body below the injury remains pink

Traumatic Asphyxia

- Management
  - Ensure airway
  - Oxygen 15 lpm if available
  - Initiate large bore IV and treat for shock
  - Treat other injuries
  - Transport to nearest medical facility

Traumatic Asphyxia

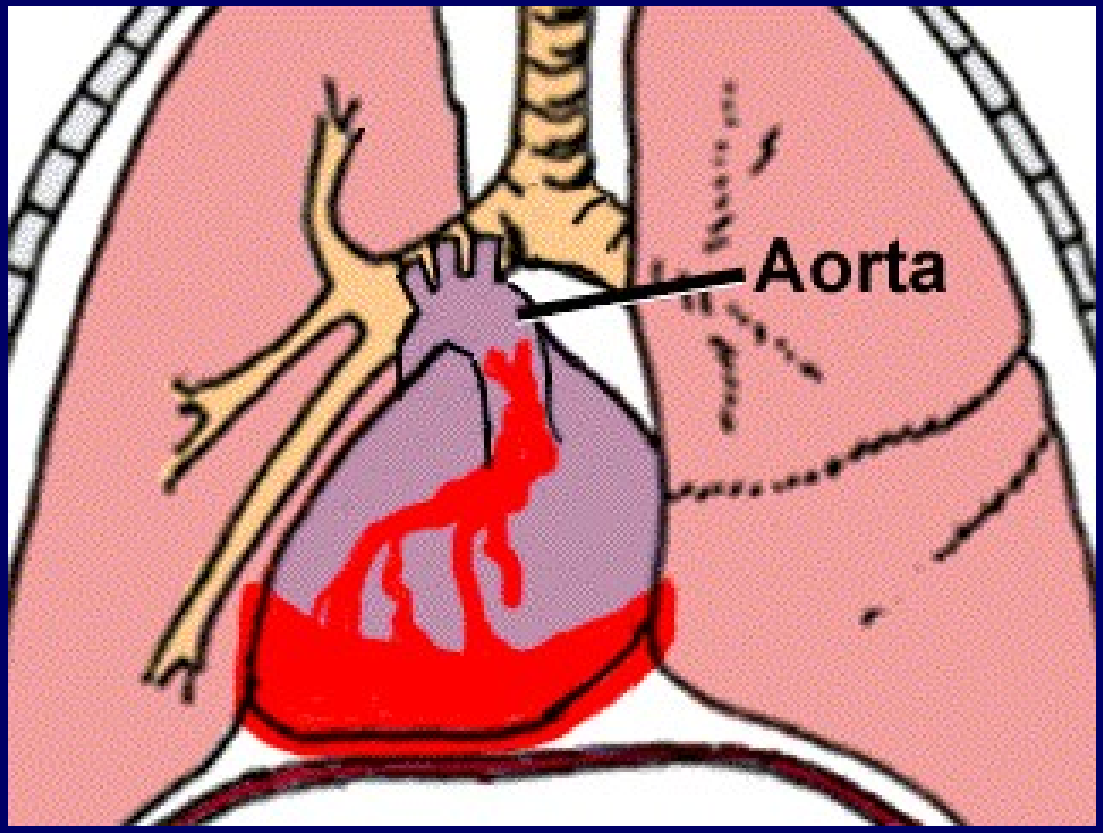


Impalement Injuries

- Caused by penetrating object (s)
- DO NOT remove object
- Management
  - Ensure airway and oxygen 15 lpm
  - Stabilize object
  - Initiate large bore IV and treat for shock
  - Transport to nearest medical facility

Impaled Object

Traumatic Aortic Rupture



Viewed from behind

Traumatic Aortic Rupture

- Most common cause of deaths in high speed MVA and falls from heights, 90% die immediately
- Diagnosis is difficult in the field
- High index of suspicion in above types of accidents
- Occasionally patients will have upper extremity hypertension and diminished lower extremity pulses

Traumatic Aortic Rupture

- Management
  - Ensure airway
  - Administer oxygen 15 lpm if available
  - Initiate large bore IV and treat for shock
  - Transport to nearest medical facility

Tracheobronchial Tree Injury

- Results from blunt or penetrating trauma
- Blunt injury may present with subtle findings
- Penetrating injuries frequently have associated major vascular injuries
- Presenting signs include:
  - Dyspnea
  - Hemoptysis
  - Subcutaneous emphysema of chest, neck, or face
  - Associated pneumothorax or hemothorax

Tracheobronchial Tree Injury

- Management
- Establishing an airway may be difficult
- Administer oxygen 15 lpm
- Initiate large bore IV and treat for shock
- Observe for pneumothorax/hemothorax
- Transport to nearest medical facility

Needle Chest Decompression

- Indications
  - Tension Pneumothorax with any two:
    - Respiratory Distress & Cyanosis
    - Decreasing Level of Consciousness
    - Loss of Radial Pulse (hypovolemia)
- Required Materials
  - 12 to 14 gauge I.V. needle w/catheter 5 cm long
  - Betadine or Alcohol Prep Pads
  - Surgical Gloves (2 pair)
  - 1/2” Tape
  - Condom or finger from glove

Needle Chest Decompression

Review anatomy of the chest and identify the following anatomical landmarks on the side of the tension pneumothorax

- **Mid-clavicular line**
- **Second intercostal space - superior edge of the 3rd rib**

Needle Chest Decompression

- Steps for performing the procedure
  - Position of Casualty: this procedure is not dependant on any single position that the casualty may be in or able to be moved to. Casualty may be lying flat, sitting etc.

Needle Chest Decompression

Site preparation: accomplished using either alcohol and or betadine prep pads to disinfect the skin

- Using your index finger trace the mid-clavicular line, then identify the second intercostal space (between the second and third ribs) on the side of the tension pneumothorax

Needle Chest Decompression

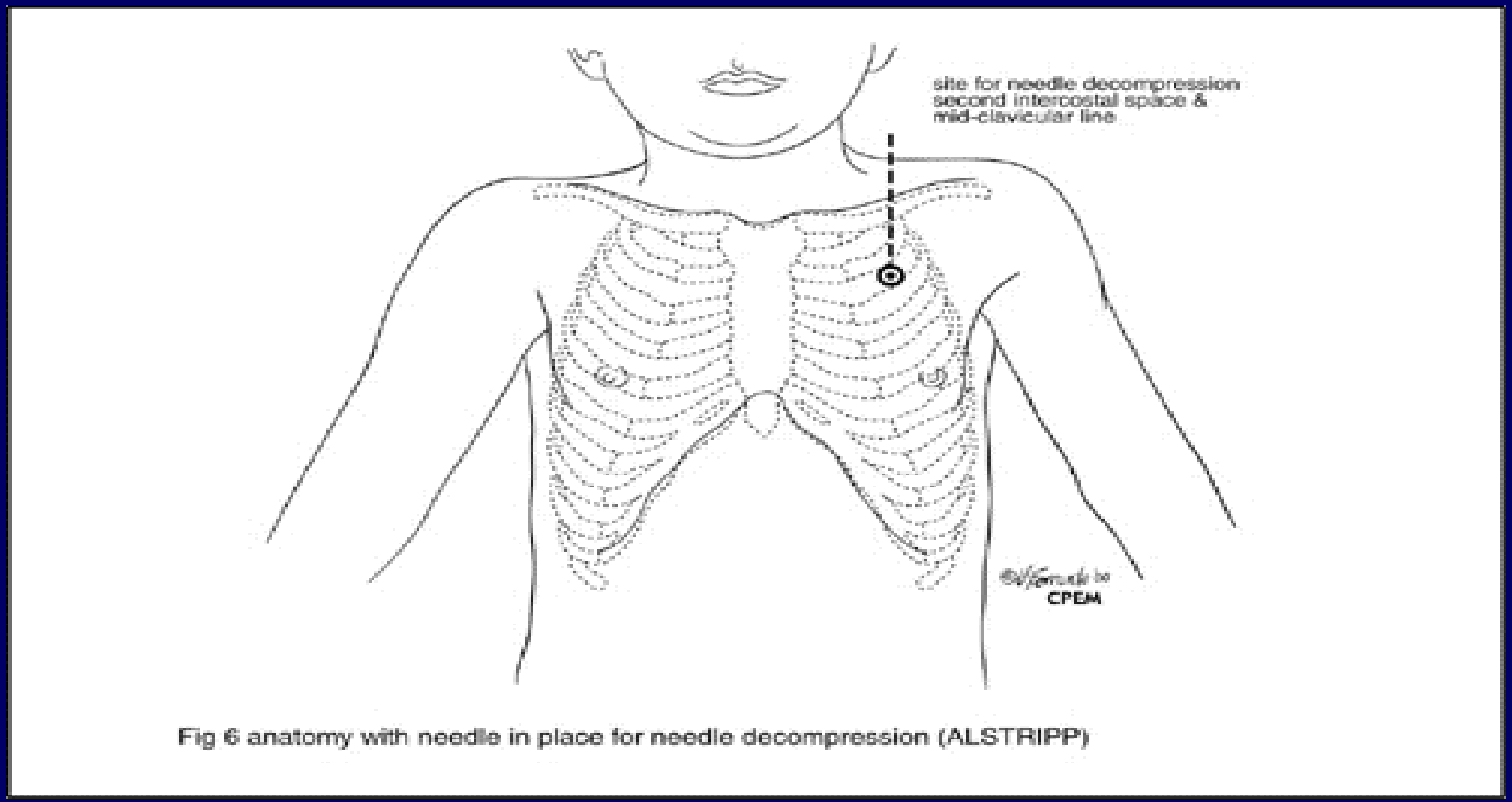


Fig 6 anatomy with needle in place for needle decompression (ALSTRIPP)

Needle Chest Decompression

- Steps for performing the procedure
  - Insert the needle perpendicular to the chest wall, directly over the top of the third rib until a palpable pop is felt followed immediately by a hissing of air escaping from the chest cavity
  - A rush of air confirms the diagnosis and rapidly improves the patient's condition
-

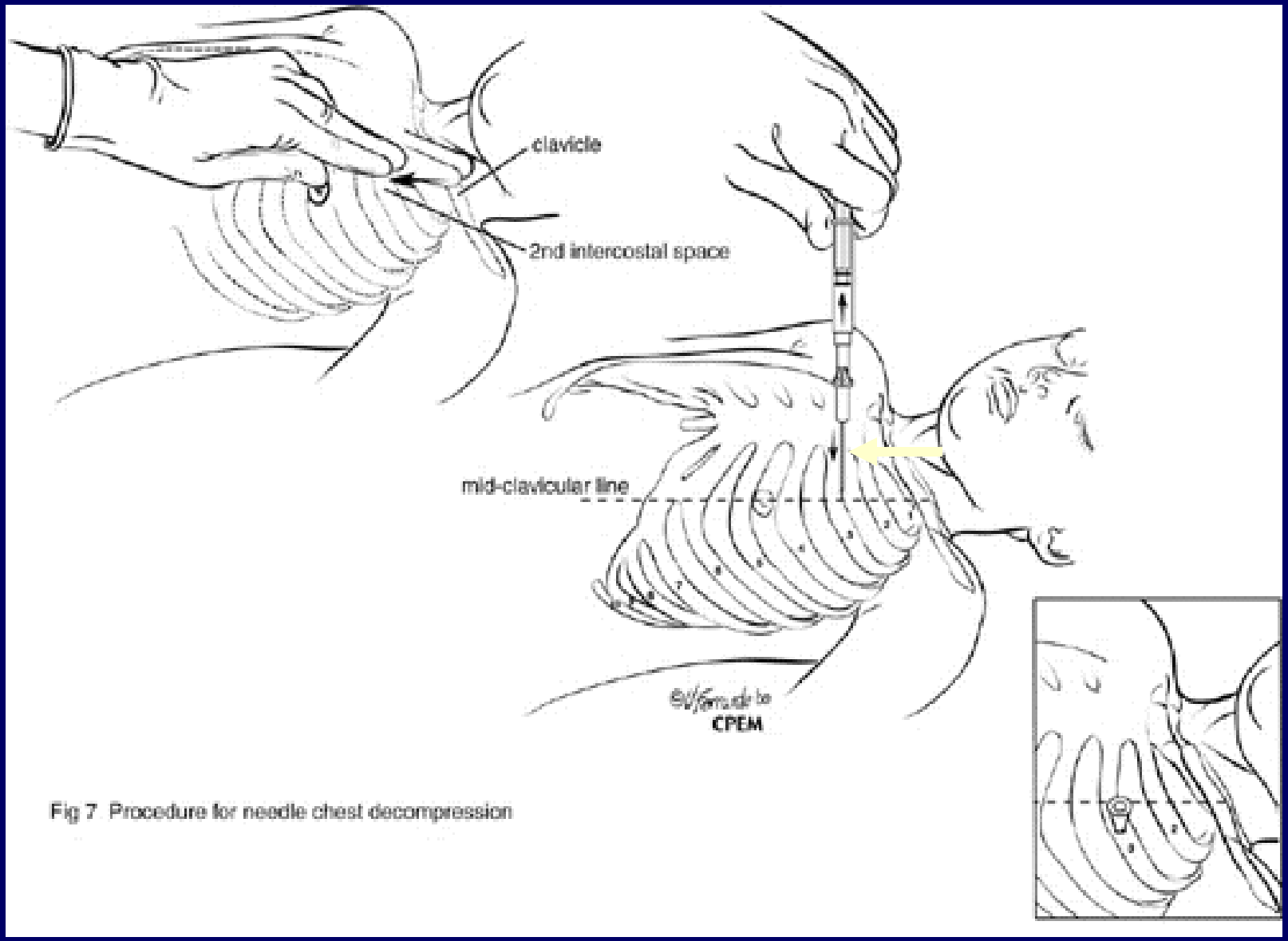
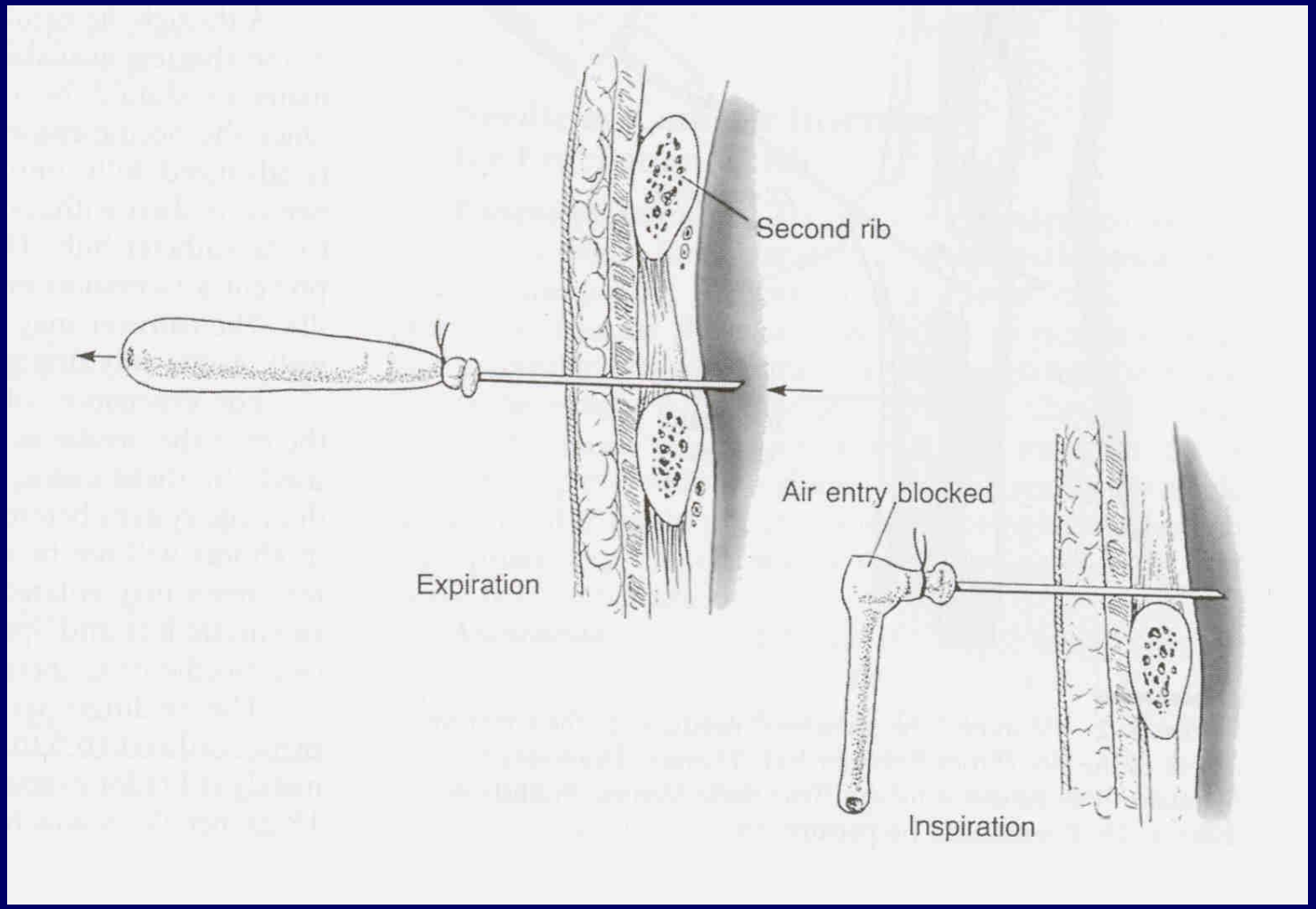


Fig 7 Procedure for needle chest decompression

Needle Chest Decompression



Complications

- Laceration of the intercostal vessels or nerve may cause hemorrhage or nerve damage
- Creation of a pneumothorax may occur if not already present
- Infection is a possibility

Questions

Summary

- In multiple trauma patients chest injuries are common and may be life threatening. You as the soldier medic must have the ability to identify chest injuries and know the treatment modalities available to you. Your prompt action may be life-saving.